The Anagyrina of the Hawaiian Islands (Hymenoptera: Encyrtidae) with Descriptions of Two New Species[1, 2]

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Encyrtid wasps which belong to the subtribe Anagyrina (Kerrich, 1967) of the tribe Ectromini are virtually all primary parasites of mealybugs. The members of this group are distinuished from those of other ectromine subtribes by having the tenth abdominal tergite greatly enlarged in the females so that it covers the greater part of the dorsum of the gaster (fig. 1, 2)[3]. Males of this group are generally smaller and of distinctly different appearance than the females. The gaster is shorter and more triangular in shape and the tenth tergite, although enlarged, covers less of its surface. The antennae of the males usually are more elongate and slender than those of the females, and bear conspicuous long slender setae not present in females.

The Anagyrina includes many important natural enemies of mealybugs. A number of our species have been purposely introduced here to combat mealybug pests while others appear to be accidental immigrants. Both of the new species described below are believed to be introductions, although their origins are obscure. They may have been imported accidentally, or one or both of them could have been introduced purposely by early biological workers, before accurate records of such introductions were kept.

In addition to the introduced forms, a large endemic complex of *Anagyrus* species exists. These are parasitic exclusively on endemic mealybugs, and are sufficiently different from other *Anagyrus* to warrant the status of a separate subgenus.

KEY TO GENERA AND SUBGENERA OF HAWAIIAN ANAGYRINA

1. Females 2
— Males[4] 8
2. Scape cylindrical or nearly so, maximum width not more than one-fifth length; antennae as long as body or nearly so.....3

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[3]Figures 1, 2, 7, 12, and 13 are the work of Miss Sybil Seto; the others are by the author.

[4]Males of our species of *Apoanagyrus* and *Gyranusoidea* were not available for study.

— Scape with lower margin slightly to strongly expanded, maximum width at least one-fourth length (fig. 3, 4); antennae distinctly shorter than length of body.....4

3. Forewing with 3 transverse infuscate bands (fig. 12); eyes not protuberant; face without a strongly elevated ridge between bases of antennae ..... *Leptomastidea* Mercet

— Forewing without transverse infuscate bands; eyes protuberant; face with a strongly elevated ridge between antennal bases..... ..... *Leptomastix* Foerster

4. Frontovertex with distinct, fine, dense, thimble-like punctation; postmarginal vein longer than stigmal vein; color flavotestaceous to orange-yellow.....5

— Frontovertex either finely reticulate, shallowly reticulopunctate, or with sculpture obscure; postmarginal vein usually shorter than stigmal, rarely about the same length; color various.....6

5. Costal cell of forewing very narrow, virtually disappearing toward apex (fig. 9A); forewing with a small infuscate spot surrounding stigmal vein in our species..... *Gyranusa* Mercet

— Costal cell normal; forewing hyaline..... *Gyranusoidea* Compere

6. Scape marked with black and white, usually strongly expanded beneath, maximum width one-third or more of length; maxillary palpi 4-segmented; labial palpi 3-segmented.....7

— Scape without areas of sharply contrasting color, only slightly expanded, maximum width equal to one-third or less of length (fig. 4 A); maxillary palpi 3-segmented; labial palpi 2-segmented..... Subgenus *Nesoanagyrus* (new) of *Anagyrus*

7. Largely black species; frontovertex largely bare, with fine, shallow, reticulum-like punctation .....*Apoanagyrus* Compere

— Largely testaceous or flavotestaceous species, sometimes partly black; frontovertex usually with decumbent whitish setae, extremely finely reticulate without appearing punctate..... ..... *Anagyrus* Howard

8. Frontovertex dark, dorsum of thorax and abdomen largely dark brown to black; postmarginal vein usually shorter than stigmal, rarely about the same length.....11

— Frontovertex yellowish, dorsum of thorax and abdomen light brown to yellowish; postmarginal vein longer than stigmal.....9

9. Costal cell at widest part several times as broad as submarginal vein; antennal club with a row of small, scalelike setae (fig. 6B); maxillary palpi 4-segmented..... *Leptomastix*

— Costal cell very narrow, hardly wider than submarginal vein; club without a row of small scale-like setae; maxillary palpi 3-segmented 10

10. Forewing with 3 incomplete transverse infuscate bands; dorsum of thorax and abdomen light brown or tan..... *Leptomastidea*

— Forewing hyaline; dorsum of body largely pale yellowish...*Gyranusa*

11. Maxillary palpi 4-segmented; labial palpi 3-segmented; maximum width of scape usually slightly more than one-third length..... ..... *Anagyrus*

— Maxillary palpi 3-segmented; labial palpi 2-segmented; maximum width of scape less than one-third length..... subgenus *Nesoanagyrus*

Genus **ANAGYRUS** Howard

Anagyrus Howard, 1896. Proc. U. S. Nat. Mus. 18: 638.

Type species: *Anagyrus greeni* Howard, ibid: 639.

Epidinocarsis Girault, 1913. Arch. f. Naturgesch. 79(6): 83.

This genus is nearly world-wide in distribution. It is represented in the Hawaiian Islands by 6 known introduced species and a large complex of endemic forms. The latter seem sufficiently distinct from other *Anagyrus* to warrant subgeneric status.

Subgenus Nesoanagyrus (new)

Nesoanagyrus, new subgenus (fig. 1, 4A)

Differs from typical *Anagyrus* as follows: Palpal segments reduced, maxillary palpi 3-segmented, labial palpi 2-segmented; scape only slightly expanded beneath, maximum width equal to about one-fourth to one-third of length, of uniform color or nearly so, not marked with strongly contrasting light and dark areas.

Type of subgenus: *Anagyrus major* Perkins, 1910. Fauna Hawaiiensis 2(6): 652.

Perkins (1910) named 6 species which belong here, and specimens of numerous additional forms, many of them reared, are at hand. All host records are from endemic Hawaiian Pseudococcidae.

The known species of this group are structurally rather uniform. The funicle segments are all shorter than the pedicel. The head is lenticular when viewed from above with smallish eyes. The width of the front-overtex is always greater (1.5 to 2 times) than the width of an eye.

The ocelli are arranged in an equilateral or obtuse triangle and the lateral ocelli are always separated by about 2 ocellus lengths from the eye margin. The forewings are often very faintly to lightly infuscate over a large part of the central portion (fig. 1). The marginal vein is short and moderately broad and the postmarginal vein is usually very short, always shorter than the stigmal vein. The stigmal vein is sometimes noticeably thickened. The gonostyli (third valvulae) are fused with the inner plate (second valvifers) as in other Anagyrina, but are often moderately to quite noticeably elongate. The type species and several others are light colored (brownish tan to flavotestaceous) and in these the face and dorsum of the thorax are covered with fairly dense decumbent

whitish setae, as in typical *Anagyrus*. Other species are largely black, and in these the whitish setae are not evident, the face and thorax appearing bare, extremely finely reticulate, with a few widely separated seta-bearing punctures. This endemic Hawaiian subgenus will be treated in detail in a later paper.

Key To Non-endemic Anagyrus of Hawaii

1. Females 2
— Males 7
2. Funicle and club entirely dark (fig. 3D); postmarginal vein about as long as stigmal ..... *A. fusciventris* Girault
— Club and usually one or more funicle segments pale; postmarginal vein distinctly shorter than stigmal 3
3. Head and pronotum dark brown to black; first 3 or 4 funicle segments dark, apical segments gradually lighter (fig. 3B); gonostyli extending beyond tip of abdomen for distance equal to length of scape ..... *A. antoninae* Timberlake
— Head and pronotum tan, dirty yellowish to yellow; one or more of first 3 funicle segments white; gonostyli shorter.....4
4. Funicle segments 1 dark, 2 and 3 white, 4–6 dark; scape relatively narrowly expanded, maximum width about one-third of length (fig. 4C) ..... *A. swezeyi* Timberlake
— Funicle segment one only dark, sometimes extending onto base of second segment; scape more strongly expanded, maximum width usually about one-half of length.....5
5. Dorsum of thorax flattened; head thin, fronto-occipital width less than one-half height (fig. 10E); antennal scrobes short, extending just above level of lower eye margin; frontovertex broad, width at anterior ocellus much greater than width of eye (fig. 10D) ..... *A. saccharicola* Timberlake
— Dorsum of thorax not flattened; head wider, fronto-occipital width at least one-half height; antennal scrobes longer, extending about to level of middle of eye; frontovertex narrower, width at anterior ocellus equal to eye width or less.....6
6. First funicle segment shorter than pedicel, almost entirely black (fig. 3C); flagellum length less than twice height of an eye..... ..... *A. dactylopii* (Howard)
— First funicle segment longer than pedicel, only basal half or less dark (fig 3A); flagellum length more than twice height of an eye ..... *A. ananatis* Gahan
7. Postmarginal vein distinctly shorter than stigmal; a row of short scale-like setae on sixth funicle segment and basal part of club (fig. 6A); volsellae of genitalia without a pair of long slender spines.....8

— Postmarginal vein about as long as stigmal; row of scale-like setae confined to club; volsellae each with a pair of long slender spines (fig. 5B) ..... *A. fusciventris*

8. Cheeks largely pale yellow; scape relatively weakly expanded, maximum width about one-third length..... *A. swezeyi*

— Cheeks dark brown to black; scape more strongly expanded, maximum width greater than one-third length.....9

9. Scape almost uniformly dark brown, not distinctly paler at base; volsellae with three small hook-like sclerotized teeth (fig. 5A) ..... *A. antoninae*

— Scape distinctly pale, at least at base; volsellae without such hook-like projections 10

10. Dorsum of thorax flattened; antennal scrobes weakly developed, less than one-half as long as scape ..... *A. saccharicola*

— Dorsum of thorax not flattened; antennal scrobes moderately well developed, more than one-half as long as scape.....11

11. Outer face of scape pale on basal third and narrowly along lower margin to apex, middle portion dark ..... *A. ananatis*

— Outer face of scape largely pale except for dark apical stripe..... ..... *A. dactylopii*

Anagyrus ananatis Gahan (Fig. 3A)

Anagyrus ananatis Gahan, 1949. Proc. Haw. Ent. Soc. 13(3): 357.

Anagyrus coccidivorus Dozier (misidentification); Carter, 1937. Jour. Econ. Ent. 30: 370; etc. (see Gahan, 1949, loc. cit.).

Type Locality: Rio de Janerio, Brazil.

Distribution: Brazil, Hawaii (Kauai?, Oahu, Molokai, Maui).

Host: Dysmicoccus brevipes (Cockerell). Specimens which I have reared developed as solitary parasites and emerged from mature (4th instar) mealybugs.

This species was purposely introduced from Brazil in 1935 (Carter, 1937). It is very similar to *A. coccidivorus*, under which name it was first recorded. Among the Hawaiian species it is quite like *A. dactylopii*, but can be distinguished by the antennal characters given in the key.

From the number of specimens in local collections this appears to be our least common introduced *Anagyrus*. It has been reared locally from *D. brevipes* on pineapple and on *Monstera deliciosa*, but although its host is one of our most common mealybugs, this parasite is seldom encountered.

Anagyrus antoninae Timberlake (Figs. 2, 3B, 5A)

Anagyrus antoninae Timberlake, 1920. Proc. Hawaiian Entomol. Soc. 4: 409, figs. 1 & 2.

Biology: Riherd, P. 1950. Florida Ent. 33: 18–22; 1951, Jour. Econ. Ent. 44: 622–23.=Dean & Schuster, 1958. Jour. Econ. Ent. 51: 363–365. Dean, 1960, Jour. Econ. Ent. 53: 694.

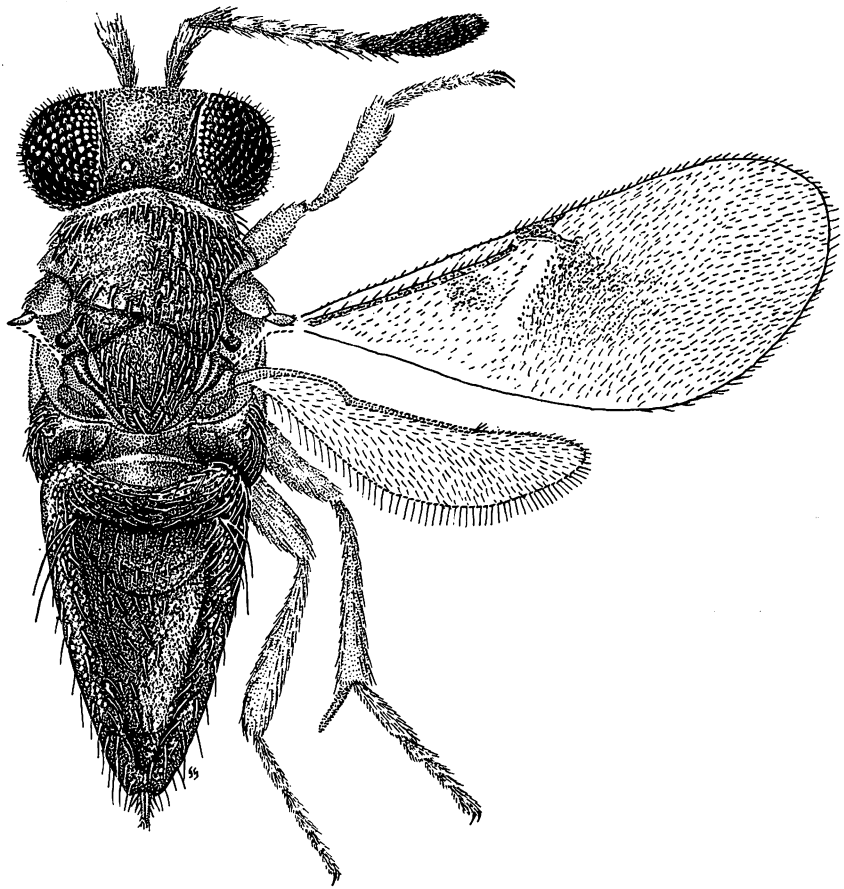

FIG. 1. *Anagyrus major*, ♀.

Type Locality: Honolulu.

Distribution: Hawaii (Oahu, Molokai, Lanai), Japan, Continental U. S. (Texas, Florida), Mexico.

Hosts: *Antonina graminis* Maskell, *Antonina crawii* Cockerell. This species develops as a solitary parasite, and emerges from fourth instar mealybugs.

A. antoninae has been reared from *Antonina crawii* in Japan (Tachikawa, 1963). I have also reared it from this host in Honolulu (on bamboo) as well as from *A. graminis*, its usual host here.

Anagyrus antoninae appears to have been accidentally introduced into Hawaii from the Orient. It was first collected on Oahu in 1919 (Timberlake, 1924). Following the spread of the Rhodes-grass scale (*Antonina graminis*) into Florida and Texas this parasite was introduced from Hawaii and became established in the affected areas.

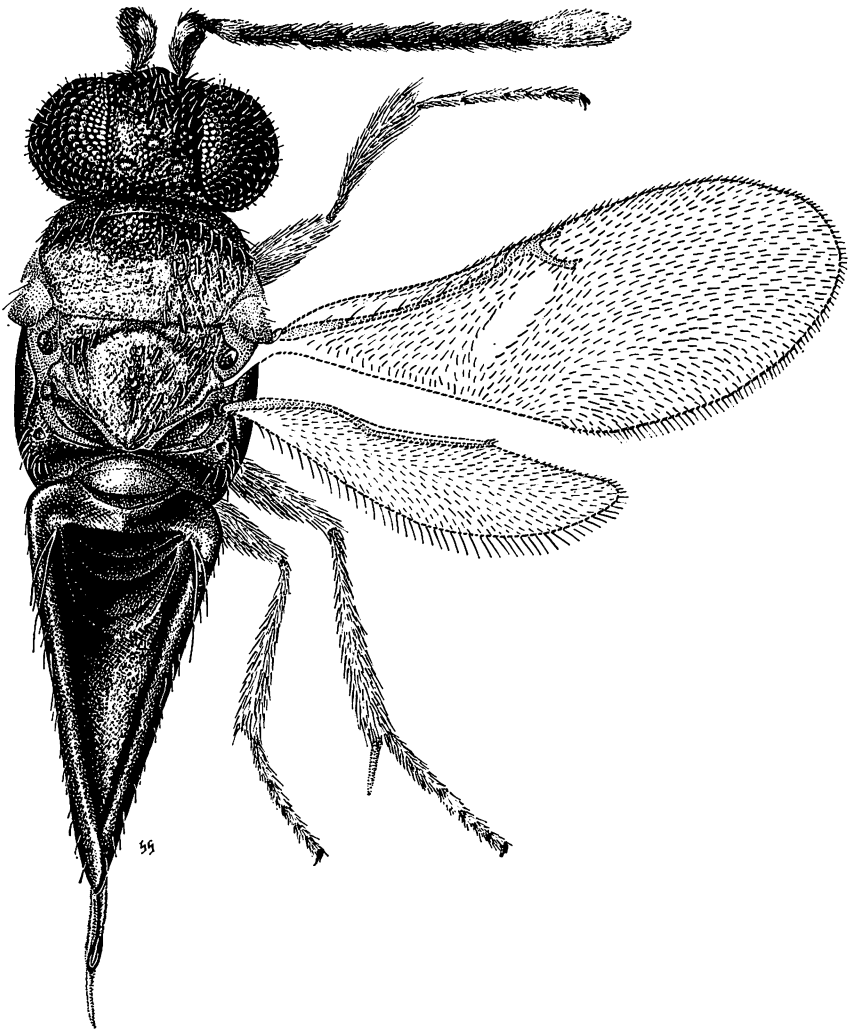

FIG. 2. *Anagyrus antoninae*, ♀.

Anagyrus dactylopii (Howard) (Fig. 3C)

Aphycus dactylopii Howard, 1898. Proc. U. S. Nat. Mus. 21: 242.

Anagyrus dactylopii, Timberlake 1924. Univ. Calif. Pubs. Ent. 3: 224; Gahan, 1949. Proc. Haw. Ento. Soc. 13(3): 359.

Type Locality: Hong Kong.

Distribution: China (Hong Kong), Hawaii (Oahu).

Host: *Nipaecoccus vastator* (Maskell). Reared specimens developed as solitary parasites and emerged from fourth instar mealybugs. This parasite was purposely introduced in 1925 from Hong Kong.

It appears to be generally effective in limiting populations of its host here, and probably now occurs everywhere in the state where *N. vastator* is found.

Anagyrus fusciventris (Girault) (Figs. 3D, 5B)

Epidinocarsis fusciventris Girault, 1915. Mem. Queensland Mus. 4: 144.

Anagyrus nigricornis Timberlake, 1919. Proc. Hawaiian Entomol. Soc. 4(1): 197.

Anagyrus fusciventris, Compere, 1943. Bul. Entomol. Res. 34: 129; 1947. Univ. Calif. Pubs. Ent. 8(1): 21.

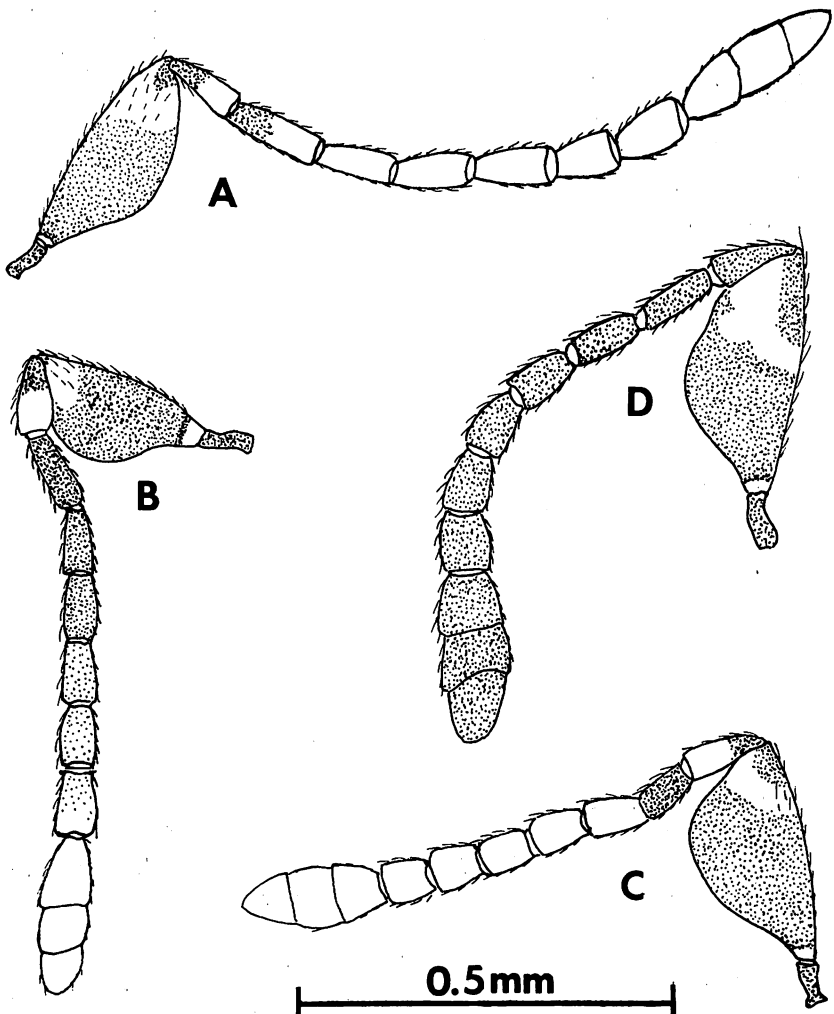

FIG. 3. *Anagyrus spp.*, ♀ *antennae:* A) *A. ananatis;* B) *A. antoninae;* C) *A. dactylopii;* D) *A. fusciventris.*

Type Locality: Australia (New South Wales).

Distribution: Australia, Indonesia, Hawaii (Kauai, Oahu, Maui, Hawaii), California, West Indies.

Hosts: *Pseudococcus longispinus* Targioni-Tozzetti (= *P. adonidum* L., of authors), *Pseudococcus* sp., *gallicola* Ehrhorn complex.

Timberlake (1919) reported that this species had been reared under "natural conditions" from *Pseudococcus montanus* Ehrhorn and *Ripersia palmarum* Ehrhorn (now *Palmicultor palmarum*) as well as from *P. longispinus* and *P. gallicola.* He also reared this parasite experimentally from *Pseudococcus* (now *Chorizococcus*) *lounsburyi* Brain. Swezey (1936) reported rearing it from *Pseudococcus* (now *Planococcus*) *citri* (Risso). I have been able to confirm only *P. longispinus* and *P. gallicola* (the latter name has been generally applied to a complex of endemic species on native sandlewoods) through rearings from field collected host material. Specimens I have reared developed as solitary parasites, emerging from mature (4th instar) mealybugs.

A. fusciventris was first collected here in March, 1910 and may have been purposely introduced, possibly by Koebele (Timberlake, 1919) who visited Australia in search of beneficial insects for Hawaii in 1904–1906. Subsequently, the species was introduced from Hawaii into southern California, where it became established, but is considered to be of little if any importance in controlling the long-tailed mealybug (Flanders, 1940).

Anagyrus saccharicola Timberlake (Figs. 4B, 5C, 6A)

Anagyrus saccharicola Timberlake, 1932. Proc. Hawaiian Entomol. Soc. 8: 159.

Type Locality: Selangor, Malaya.

Distribution: Africa (Natal), India, Malaya, Philippines, Formosa, Ryukyu Is., Fiji, Hawaii (Kauai, Oahu, Molokai, Lanai, Maui, Hawaii).

Host: *Saccharicoccus sacchari* (Cockerell). This parasite develops in third or fourth instar (mature) hosts. Only one parasite may emerge from small hosts, but large mature mealybugs have yielded as many as 19 normal *A. saccharicola* adults.

Anagyrus saccharicola was purposely introduced from the Philippine Islands in 1930 to combat the pink sugarcane mealybug, *S. sacchari.* Pemberton (1948) credits this parasite with effecting satisfactory biological control of its host in Hawaii.

Anagyrus swezeyi Timberlake (Fig. 4C)

Anagyrus swezeyi Timberlake, 1919. Proc. Hawaiian Entomol. Soc. 4(1): 199.

Type Locality: Hawaii (Oahu).

Distribution: Hawaii (Kure, Midway, Kauai, Oahu, Molokai, Maui, Hawaii).

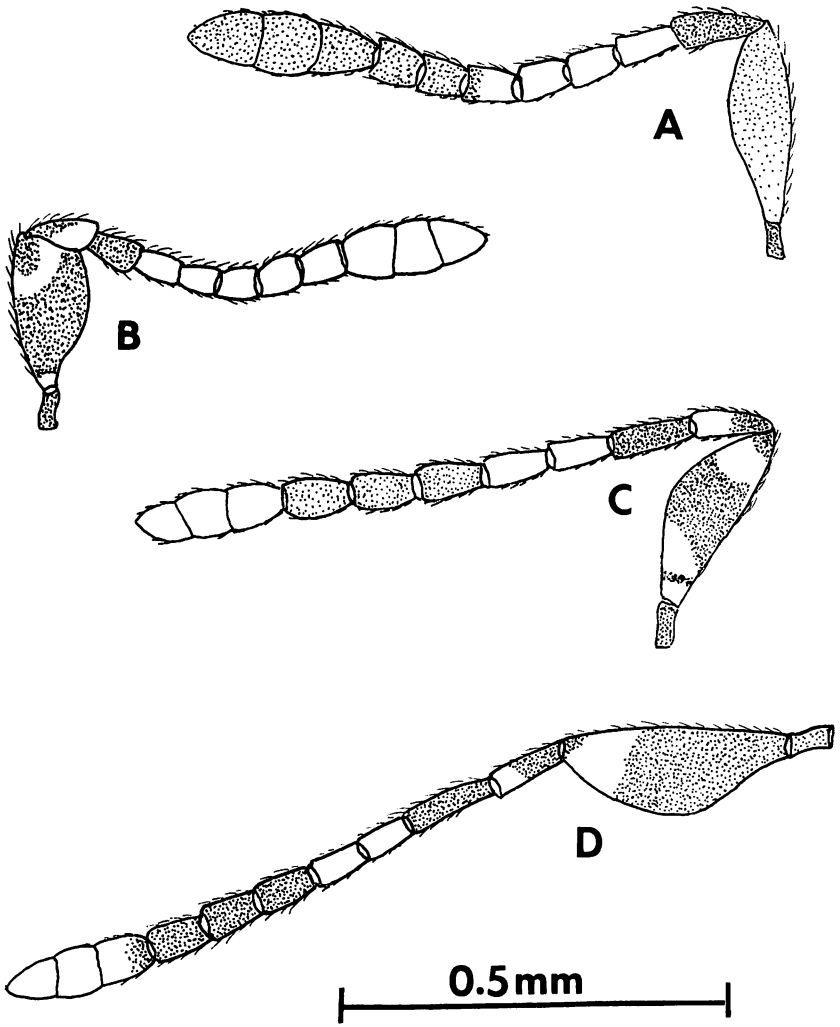

FIG. 4. *Female antennae:* A) *Anagyrus major;* B) *A. saccharicola;* C) *A. swezeyi;* D) *Apoanagyrus californicus*

Host: Chorizococcus rostellum (Lobdell). Most of the published host records for this species refer to *Trionymus insularis* Ehrhorn, an apparently endemic grass-infesting mealybug. However, Beardsley (1957) has shown that *C. rostellum* has been present on grasses in Hawaii for many years and formerly was confused with *T. insularis*. *A. swezeyi* has been reared from *C. rostellum* on numerous occasions by me but never from *T. insularis*. Therefore, I consider the records of this species from *insularis* doubtful. Specimens which I have

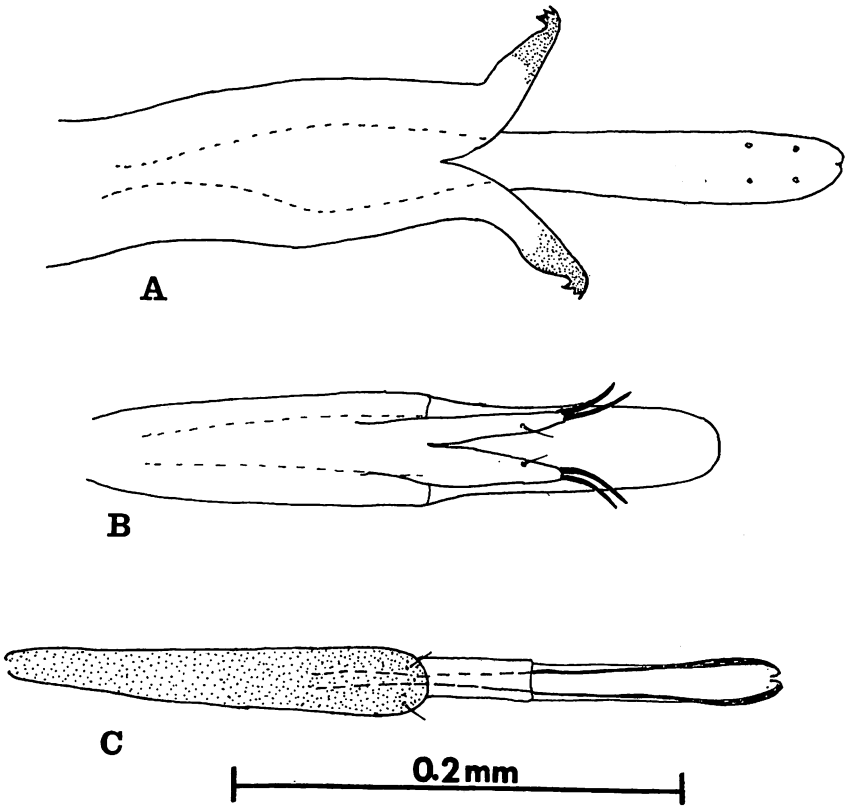

FIG. 5. *Anagyrus* spp., ♂ *genitalia:* A) *A. antoninae;* B) *A. fusciventris;* C) *A. saccharicola.*

reared emerged as solitary parasites from mature (4th instar) mealybugs.

Anagyrus swezeyi is presumed to have been accidentally introduced into Hawaii, but its origin is unknown. According to Timberlake (1924) it was first collected on Oahu by Swezey in August, 1910. Timberlake (1919) suggested that this parasite might be endemic to Hawaii. However, this seems unlikely as it is quite distinct from the endemic *Anagyrus* complex, and the only confirmed host is an introduced mealybug.

Genus **APOANAGYRUS** Compere

Apoanagyrus Compere, 1947. Univ. Calif. Pubs. Entomol. 8(1): 18.
Type Species: Apoanagyrus californicus Compere.

This small genus, containing but two described species, is closely allied to *Anagyrus.*

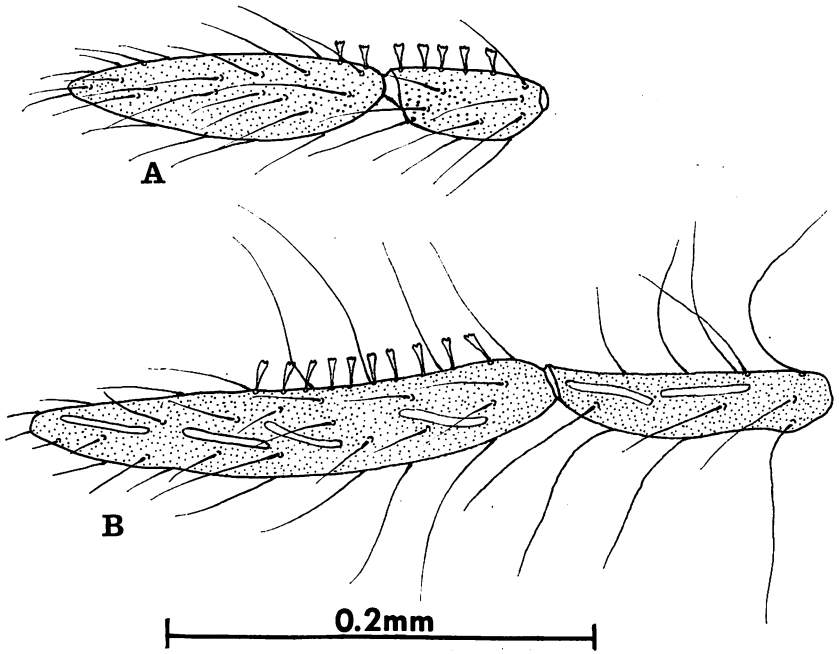

FIG. 6. ♂ *antennae, club and last funicle segment:* A) *Anagyrus saccharicola;* B) *Leptomastix dactylopii.*

Apoanagyrus californicus Compere (Fig. 4D)

Apoanagyrus californicus Compere, 1947. Univ. Calif. Pubs. Entomol. 8(1): 18, fig. 7; Beardsley, 1957. Proc. Hawaiian Entomol. Soc. 16(2): 186.

Type Locality: Riverside, California

Distribution: California, Hawaii (Oahu, Hawaii)

Host: *Phenacoccus solani* Ferris. This species has not yet been reared in Hawaii, but its host is presumed to be the same here as in California.

Apoanagyrus californicus appears to be an accidental introduction. The first specimens were collected here by Swezey at Koko Head, Oahu, in March, 1943. Subsequently, it has been collected elsewhere on Oahu and at Pohakuloa, Hawaii (6,000 ft.). No males have yet been seen here.

Genus **GYRANUSA** Mercet

Gyranusa Mercet, 1921. Fauna Iberica Himenopteros, Fam. Encirtidos. Mus. Nac. de Cien. Nat., Madrid., p. 123.

Type species: *Gyranusa matritensis* Mercet.

The species described below is placed provisionally in *Gyranusa.* It

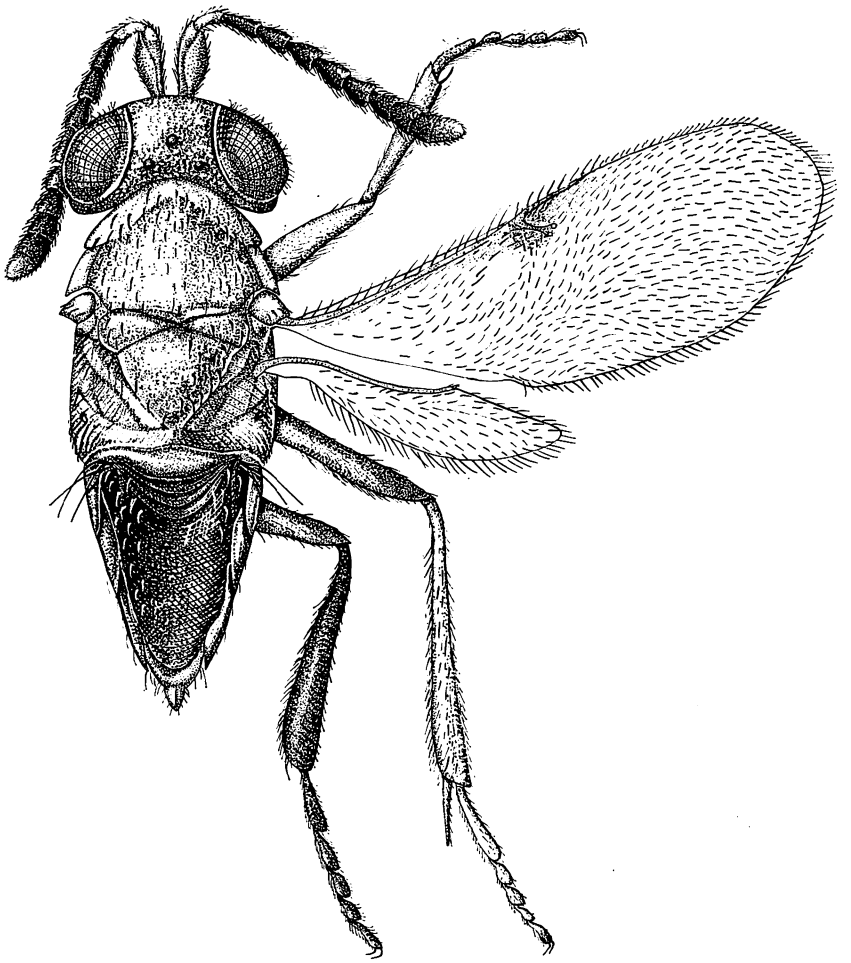

FIG. 7. *Gyranusa phenacocci*, ♀.

also shows considerable similarity to the type species of *Leptanusia* De Santis (1963), *Leptomastidea pseudococci* Brethes.

Gyranusa phenacocci, n. sp. (Figs. 7, 8, 9).

Female. Head in dorsal aspect (Fig. 8A) meniscoidal, as wide as thorax at tegulae, about 3 times as wide as long; frontovertex at lateral ocelli distinctly wider than an eye (10: 7). Ocelli in a nearly equilateral triangle, the base slightly longer than sides (6: 5); lateral ocelli about one ocellus length from occipital margin, slightly more from eye margin. Head in frontal view (Fig. 8B) about as wide as high, cheeks short, strongly convergent below eyes; distance from lower eye margin to oral margin about 2/7 eye height. Antennae inserted slightly below level of lower eye margin;

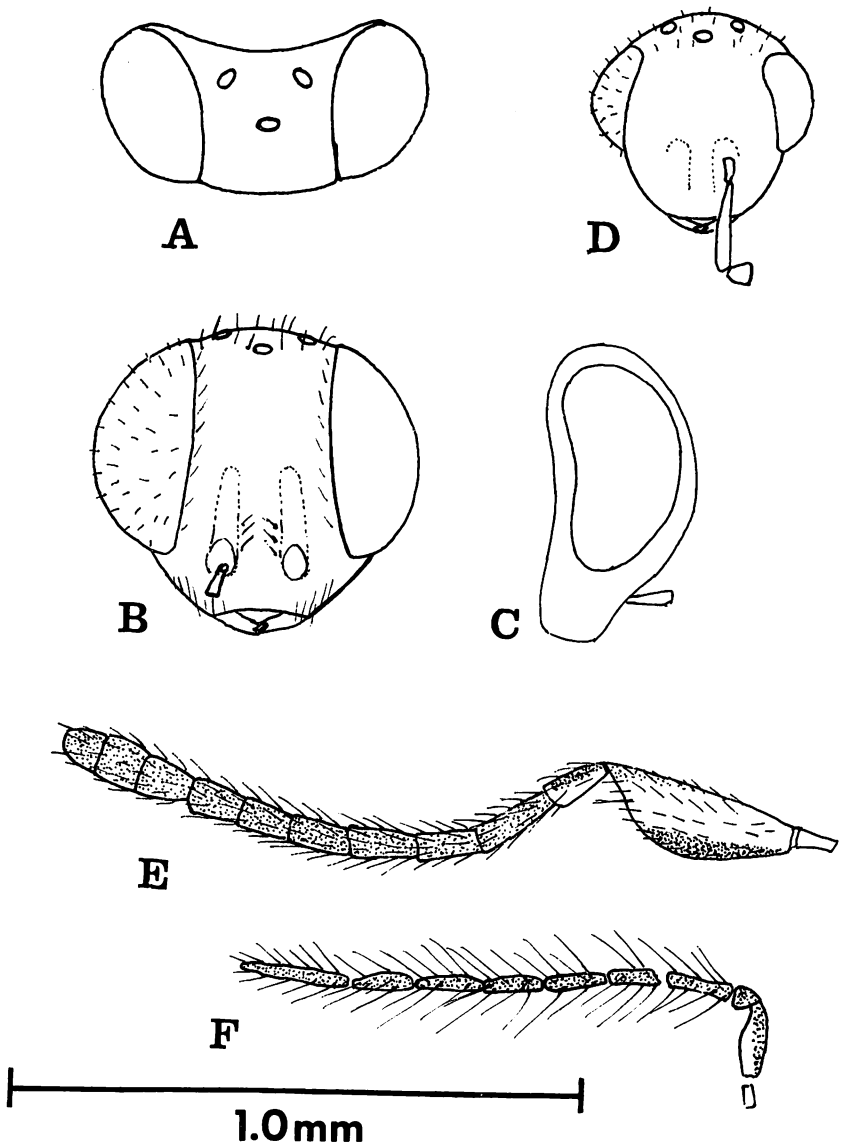

FIG. 8. *Gyranusa phenacocci:* A–C) ♀ *head, dorsal, frontal and lateral aspects;* D) ♂ *head, frontal aspect;* E) ♀ *antenna;* F) ♂ *antenna.*

antennal scrobes well defined, moderately shallow, polished, not meeting above, separated by a broad, weakly convex rise.

Mesoscutum less than twice as long as wide (11: 7), slightly convex. Scutellum approximately as long as wide; nearly flat, slightly downcurved apically. Axillae with inner apices just meeting. Gaster (dried specimen) triangular, slightly longer than broad (16: 13), shorter than thorax. Ovipositor rather short, apex barely visible from above.

Antennae (Fig. 8E) moderately elongate, length of pedicel plus flagellum slightly more than distance from anterior margin of frontovertex to tip of scutellum. Scape length equal to about 3/4 head width, scape distinctly expanded beneath, foliaceous, maximum width slightly more than 1/3 length (5: 14); pedicel distinctly shorter than first funicle segment; all funicle segments longer than wide; club only slightly expanded; entire flagellum densely clothed with short dark setae. Mandibles bidentate with acute teeth; labial palpi 3-segmented; maxillary palpi 3-segmented.

Forewing nearly 3 times as long as maximum width (11: 4), as long as entire body in dry specimens. Costal cell very narrow; width less than that of submarginal vein in apical third (Fig. 9A); submarginal vein nearly straight; marginal vein moderately short, length less than stigmal vein; postmarginal vein elongate, more than twice as long as stigmal, becoming evanescent apically. Submarginal vein largely light brown, the apical one-fifth becoming paler; marginal, stigmal, and basal half of postmarginal dark brown; distal half of postmarginal becoming paler. Wings hyaline except small weakly infuscate area extending behind marginal and basal half of postmarginal veins, and surrounding stigmal vein.

Legs elongate, slender; length of middle tibia equal to distance from anterior margin of frontovertex to tip of scutellum.

Head and thorax largely yellow-orange; pronotal collar, tegulae propleurites and propodium somewhat paler; dorsum of gaster mostly dark brown, becoming paler at base and sides; venter of gaster largely pale. Eyes dark reddish, ocelli slightly more reddish than frontovertex. Apical half of radicle, lower margin of scape, upper margin of pedicel except for apical fifth, and entire flagellum dark fuscous; remainder of antenna pale luteous except for a diffuse infuscate area on upper margin of scape near apex; pale areas of scape and sides of gaster sometimes tinged with orange. Legs with lower surfaces pale and upper surfaces noticeably infuscate; except hind tibia and tarsus fuscous throughout; fore and middle tarsi pale or very weakly infuscate, apical tarsal segment slightly darker.

Face, and frontovertex dull, with dense, fine, thimble-like punctation. Axillae and scutellum dull, minutely reticulate; mesoscutum more shining with widely separated, fine, shallow, setigerous punctures and very weak, fine reticulation discernible in slide-mounted specimens; pro- and meso-

pleurites weakly, finely reticulate.

Eyes with scattered short dark reddish-brown setae; similar setae scattered on frontovertex and in a row along occipital margin; face with a row of 3 dark setae on inner margin of each antennal scrobe, just above insertion of antennae; a few fine inconspicuous pale setae scattered on face and in row along inner margin of each eye; somewhat longer pale setae on oral margin of face and lower cheeks. Pronotal collar with a row of slightly longer dark setae near posterior margin, plus several additional dark setae laterally in front of these. Mesoscutum with sparse scattered decumbent setae, these dark on anterior mesal portion, becoming paler on posterior and lateral margins; axilliae and scutellum with similar short dark setae, plus two pairs of long, erect, dark setae on apical fourth; tegulae with a transverse row of about 6 dark setae across middle. Dorsum of gaster with scattered pale setae.

Lenght: 1.5 mm.

Male. Generally smaller but similar to female except as follows: Eyes relatively small, nearly circular in outline; cheeks longer than height of eye (Fig. 8D). Antennae as in Fig. 8F; scape short, slightly expanded below, the dorsal half dark, ventral half pale; without a row of scale-like setae on venter of club and last funicle segment; pedicel and flagellum entirely fuscous. Wings without an infuscate spot surrounding stigmal vein. Male genitalia (Fig. 9B) with very short volsellae, each with two acute recurved spines. Color mostly dull yellowish; pronotal collar dark brown; mesoscutum and scutellum weakly tinged with brown; abdomen brownish.

Length: 1.0 mm.

Holotype female and 8 *female paratypes:* Honolulu, Oahu, XII-1962, ex mealybug on *Crotolaria spectabilis*, Sun Fo Wong, collector. *Additional paratypes:* 4♀♀, 1♂, Mapulehu, Molokai, XI-6-1961, reared ex *Phenacoccus gossypii* on *Crotolaria*, J. W. Beardsley; ♀, Honolulu, Oahu, XII-28-1965, J. W. Beardsley. Additional ♀♀ and ♂♂ on slides; Honolulu, Oahu IX and X-1954, reared ex *Phenacoccus gossypii* on *Buddlia* sp., J. W. Beardsley. Some of the Molokai specimens are noticeably smaller than the holotype, but otherwise similar.

Holotype deposited in B. P. Bishop Museum, Honolulu.

This species differs somewhat from Mercet's (1921) and Compere's (1947) concepts of the genus *Gyranusa*. Particularly, it lacks abundant flattened white setae on head and thorax and the postmarginal vein is much longer than the marginal and stigmal veins. However, it seems better placed here than in any of the other anagyrine genera with the possible exception of *Leptanusia* De Santis (1963). *G. phenacocci* possibly is most closely allied to the species described as *Tanomastix claripennis* from California (Timberlake, 1918). The type of *Tanomastix*, *Paraleptomastix abnormis* Ginault, was earlier designated the type of *Leptomastidea* Mercet,

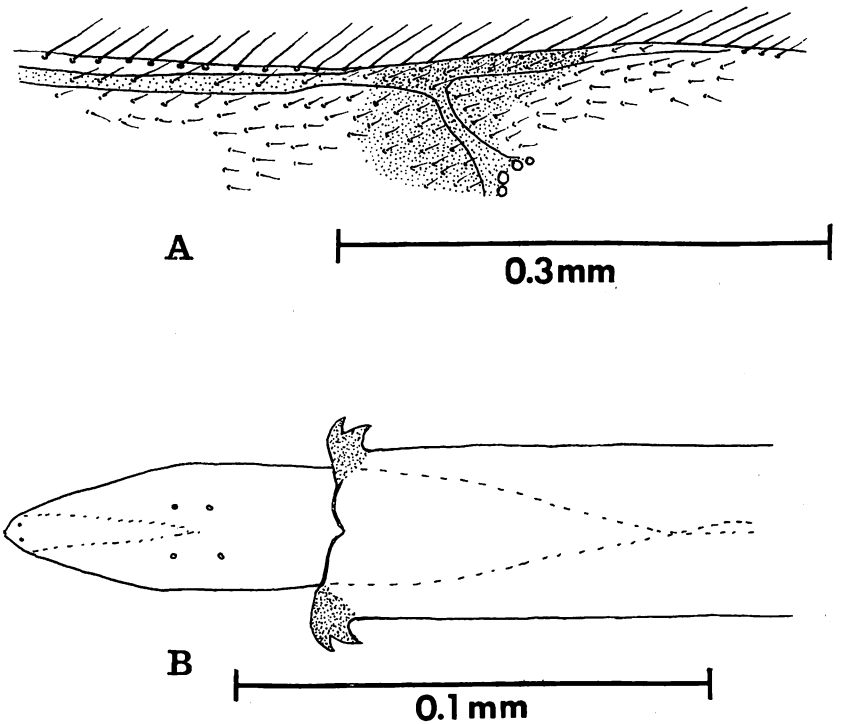

FIG. 9. *Gyranusa phenacocci:* A) ♀ *forewing, details of venation;* B) ♂ *genitalia, apical part.*

and *T. claripennis* is assigned to the latter genus by Muesebeck *et al.* (1951), although Timberlake (personal communication) has indicated that both *claripennis* and *phenacocci* seem better placed in *Gyranusa.*

This species is a parasite of the Mexican mealybug, *Phenacoccus gossypii* Townsend and Cockerell, and is presumed to have originated somewhere in the Neotropical Region. Reared specimens developed as solitary parasites, and emerged from fourth instar mealybugs.

Genus **GYRANUSOIDEA** Compere

Gyranusoidea Compere, 1947. Univ. Calif. Pubs. Entomol. 8(1): 17.
Type Species: *Gyranusa citrina* Compere.

The single species present in Hawaii appears to be undescribed.

Gyranusoidea advena, n. sp. (Figs. 10, 11).

Female. Head in dorsal aspect (Fig. 10A) meniscoidal, as wide as mesoscutum, frontovertex at lateral ocelli about twice as wide as eye (11: 6), slightly wider than long (12: 11) ocelli in a nearly equilateral triangle, base slightly longer than sides (4: 3), lateral ocelli about one

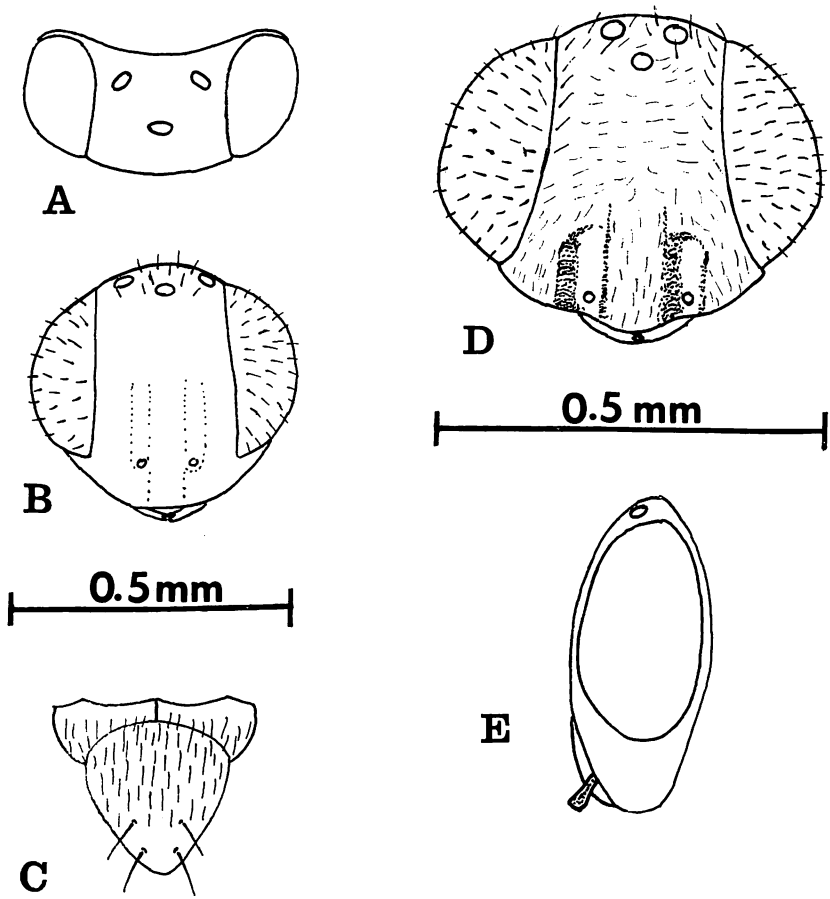

FIG. 10. A–C) *Gyranusoidea advena* ♀: A–B) *head, dorsal and frontal aspects;* C) *scutellum and axillae;* D–E) *Anagyrus saccharicola* ♀ *head, frontal and lateral* aspects.

ocellus length from eye margin and occipital margin. Head in frontal view (fig. 10B) slightly broader than high (11: 10); cheeks short, strongly convergent below eye; distance from lower eye margin to oral margin about 1/5 height of head. Antennae inserted just slightly below level of lower eye margin; distance between insertions about equal to distance between eye margin and insertion; antennae scrobes moderately shallow, unpolished, not meeting above; face between scrobes moderately convex.

Mesoscutum about twice as broad as long, slightly convex; axillae and scutellum slightly convex; inner apices of axillae broadly joined (Fig. 10C); scutellum about as broad basally as long, apical third slightly downcurved. Gaster (dried specimens) longer than broad (4: 3), about as long as thorax; ovipositor rather short, generally not visible from above.

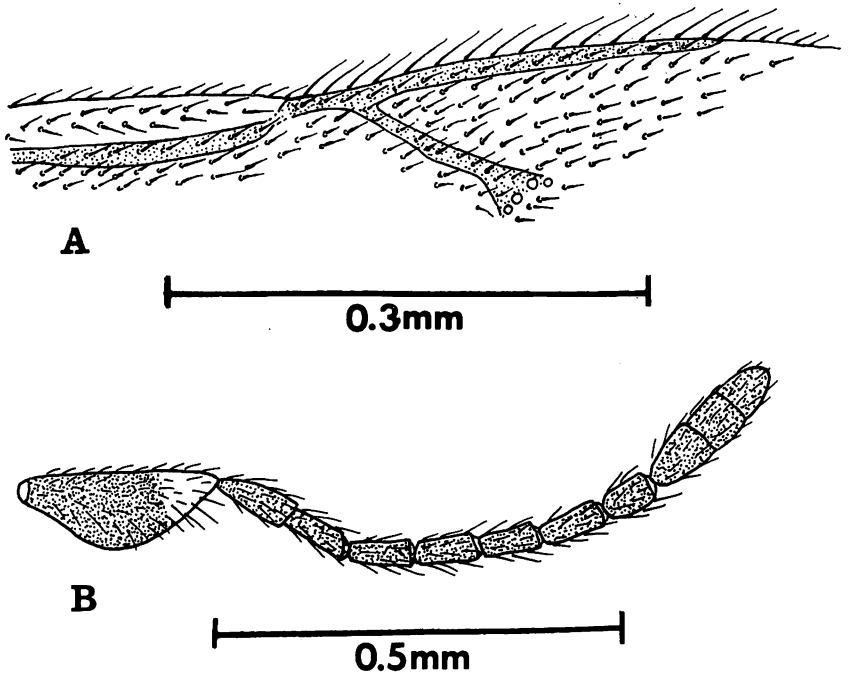

FIG. 11. *Gyranusoidea advena*, ♀: A) *forewing, details of venation;* B) *antenna.*

Antennae (Fig. 11B) moderately long, length of pedicel plus flagellum equal to that of head and thorax; scape expanded, foliaceous beneath, maximum width about 2/5 length, length slightly less than eye height (4: 5); pedicel as long as or a trifle longer than first funicle segment; all funicle segments longer than broad; club slightly expanded, apically rounded. Mandibles with two acute teeth; maxillary and labial palpi each three segmented.

Forewing slightly less than 3 times as long as maximum width (8: 3), as long as entire body (excluding appendages); costal cell moderately wide, wider than submarginal vein for almost entire length (Fig. 11A); submarginal vein nearly straight, slightly upcurved near apex, apical fourth somewhat thickened, becoming evanescent or briefly interrupted just before juncture with marginal vein. Marginal about 5 times as long as wide, about 1/2 as long as stigmal; postmarginal elongate, nearly twice as long as stigmal. Legs moderately elongate; middle tibia about as long as gaster.

Face and frontovertex dull, with fine, dense, thimble-like punctation; mesoscutum, axillae and scutellum dull, very finely reticulate; pro- and mesopleurites finely reticulate; dorsum of gaster very weakly, somewhat less closely reticulate (visible in slide-mounted specimens).

Eyes and frontovertex with sparse, short, erect, dark setae; cheeks

and face above oral margin with fine light setae. Pronotal collar with transverse row of partially decumbent dark setae near hind margin; mesoscutum, axillae and scutellum with moderately dense decumbent whitish setae; two pair of erect, long dark setae on apical third of scutellum; tegulae with a transverse row of about 6 dark setae near middle, plus 2 or 3 near apex. Dorsum of gaster with fine decumbent whitish setae.

Frontovertex, mesoscutum, axillae and scutellum flavotestaceous or flavescent; face, cheeks, pronotal collar, basal two-thirds of tegulae, metanotum and thoracic pleurites distinctly paler, apical third of tegulae weakly infuscate. Dorsum of propodium and gaster mostly pale brown; inner occipital area and anterior (hidden) part of pronotum brown; venter mostly pale, mesosternum dark brown. Antennae mostly dark fuscous to blackish, except apical 1/4 of scape white. Legs mostly pale luteous or weakly flavotestaceous; mesocoxae dark brown, base of hind coxae and apical segment of all tarsi with slight brownish tinge; wings hyaline, veins brown.

Male. Unknown.

Holotype ♀: Kokee, Kauai, VIII-4-7-1961, Maa, Miyatake and Yoshimoto. Paratypes: 2, Kokee, Kauai, IX-13-17-1965, Beardsley; 2, same data, Yoshimoto; 3, Mt. Tantalus, Oahu, VI-1957, Beardsley, reared ex *Pseudococcus pipturicolus* Beardsley; 1, same data, V-1960; 1, Mt. Kaala, Oahu, XII-5-1956 Beardsley, reared ex *Pseudococcus antricolens* Ferris on *Santalum.* Holotype in B. P. Bishop Museum.

Gyranusoidea advena differs from the type of the genus, *G. citrina* (Compere) (1938), in having the scape more strongly expanded, with different shape and markings. In *G. citrina* the scape attains maximum width at about two-fifths of the distance from base to apex, whereas in *G. advena* the widest part is about at the middle. In *citrina* the scape has a narrow white basal ring, and the entire apical half is largely white instead of just the apical fourth. The pedicel and flagellum also are lighter colored in *citrina* (mostly sordid whitish or white suffused with brown). The venation of the forewing of *citrina* differs from that of *advena* in that the marginal vein of the latter is relatively short (about half the length of the stigmal vein instead of subequal to it) and the postmarginal vein is much more elongate. The forewings are relatively longer and narrower in *advena.*

This species has been collected only in cool upland forest areas (1,800–4,000 feet) on Oahu and Kauai. It has been reared from two endemic *Pseudococcus* species, but is not closely allied to the endemic anagyrine complex of mealybug parasites, and is therefore presumed to be adventive. Reared specimens developed as solitary parasites and emerged from fourth instar mealybugs.

Genus **LEPTOMASTIDEA** Mercet

Leptomastidea Mercet, 1916. Bol. Soc. Espan. Nat. Hist. 16: 112.

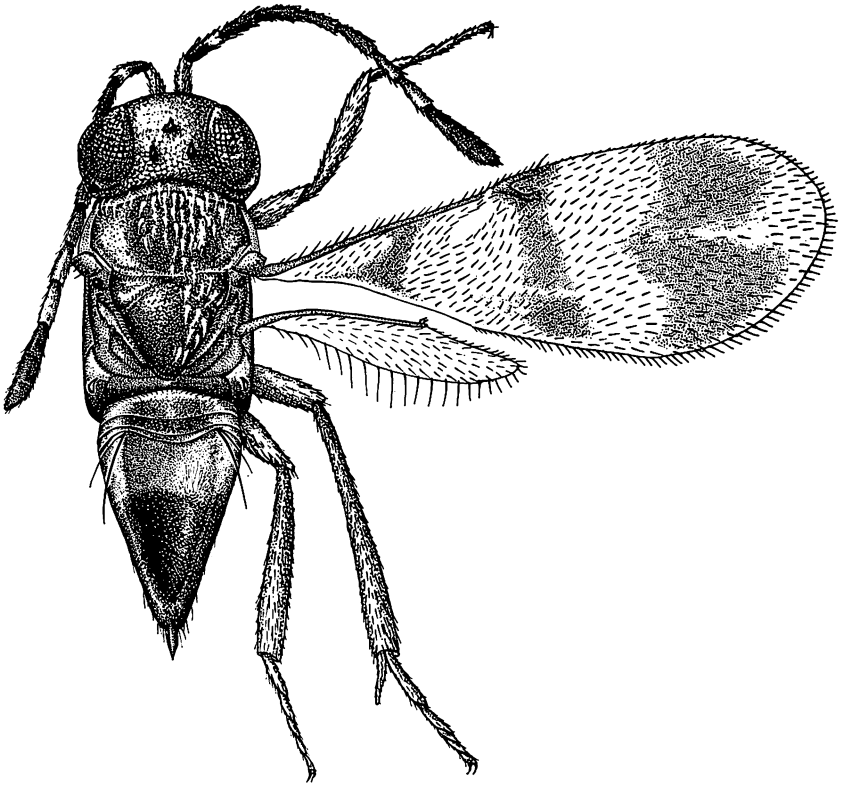

FIG. 12. *Leptomastidea abnormis*, ♀.

Type Species: *Leptomastidea aurantiaca* Mercet.

Tanaomastix Timberlake, 1918. Univ. Calif. Pubs. Entomol. 1: 362. A single widespread species is present in Hawaii.

Leptomastidea abnormis (Girault) (Fig. 12)

Paraleptomastix abnormis Girault, 1915. Entomologist 48: 184.

Tanaomastix abnormis, Timberlake, 1918. Univ. Calif. Pubs. Entomol. 1: 366; (8)366; 1919. Proc. Hawaiian. Entomol. Soc. 4(1): 186.

Leptomastidea abnormis, Smith and Compere 1928. Jour. Econ. Entomol. 21: 668.

Type Locality: Sicily.

Distribution: Southern Europe, Africa, Australia, New Zealand, Japan, Hawaii (Kauai, Oahu, Molokai, Hawaii), North and South America.

Hosts: Principally *Planococcus citri* (Risso) in Hawaii. Timberlake (1919) reported that it had been reared from *Ferrisia virgata* (Cockerell) here. Local records of this species from *Pseudococcus* (= *Planococcus*) *kraunhiae*

(Kuwana) are the result of misidentifications of *P. citri* as the former does not occur here. In the U. S. it is reported to attack *P. kraunhiae*, *Phenacoccus gossypii* Townsend and Cockerell, *Pseudococcus maritimus* Ehrhorn, and *Pseudococcus* sp. in addition to *P. citri* (Tachikawa, 1963). Most of the specimens I have reared apparently emerged from third instar mealybugs. According to Clausen (1956) *L. abnormis* is said to be effective parasite of *P. citri*, although it does not control the mealybug in all areas.

Genus **LEPTOMASTIX** Foerster

Leptomastix Foerster, 1856. Stud. Hymen. 2: 34, 37.
Type Species: *Leptomastix histrio* Mayr, 1876.

A single widely distributed species is present in Hawaii.

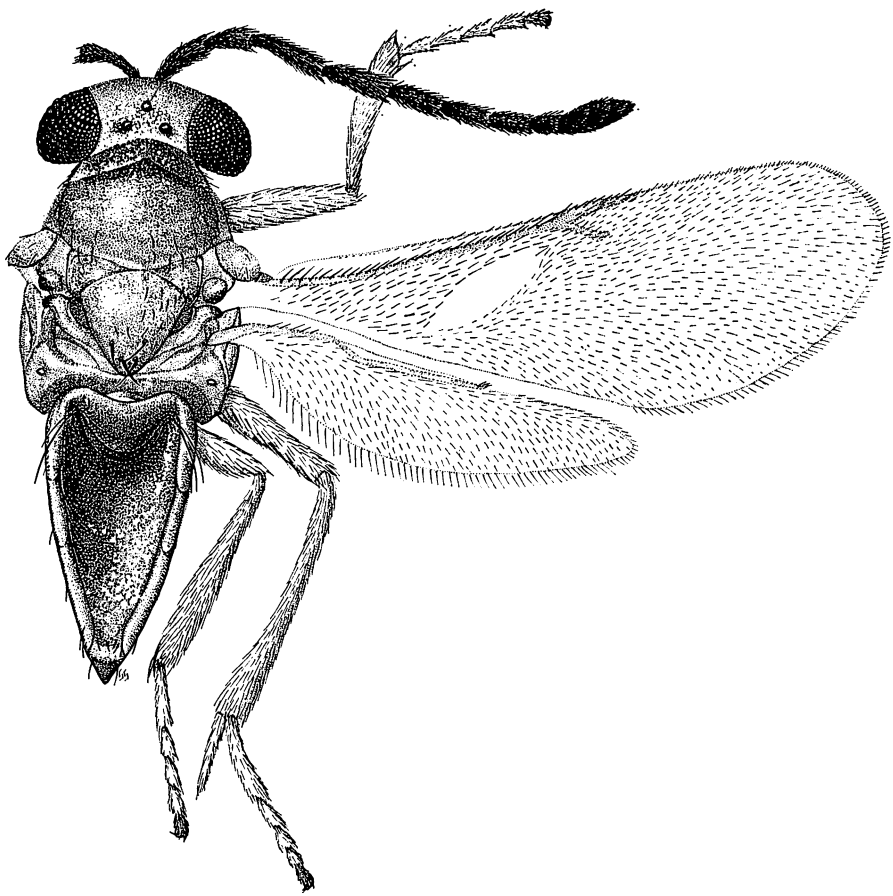

FIG. 13. *Leptomastix dactylopii*, ♀.

Leptomastix dactylopii Howard (Figs. 6B, 13)

Leptomastix dactylopii Howard, 1885. U. S. Dept. Agr. Bur. Entomol. Bul. 5: 23; Compere, 1939. Univ. Calif. Pubs. Entomol. 7: 57, fig. 1; Fullaway, 1946. Proc. Hawaiian. Entomol. Soc. 12(2): 464.

Type Locality: Washington, D. C.

Distribution: Israel, Japan, Hawaii (Oahu, Maui), North America, West Indies, South America.

Hosts: Planococcus citri (Risso), the citrus mealybug, is the principal and possibly the only host in Hawaii. Tachikawa (1963) lists *Phenacoccus gossypii* Townsend and Cockerell as a host here, apparently on the strength of the original record of Fullaway (1946) who reported breeding it from a mixed infestation of *P. gossypii* and "*Pseudococcus kraunhiae* (Kuwana)", the latter a misidentification of *P. citri*. The parasites probably emerged from *P. citri* specimens in this material. *L. dactylopii* has been reported from several other mealybugs elsewhere, but Lloyd (in Zinna, 1960) is of the opinion that these records are from laboratory rearings, and that under field conditions the parasite is almost certainly confined to *P. citri*. Lloyd states that females of *L. dactylopii* oviposit in third instar nymphs and "adults" (4th instar) of *P. citri*. Specimens which I have reared developed as solitary parasites, and emerged from fourth instar mealybugs.

L. dactylopii appears to be an accidental introduction into Hawaii. It was first discovered in Honolulu in February, 1945 by Fullaway. The species has been utilized in attempts at biological control of the citrus mealybug in California and elsewhere, but apparently is unable to survive except in tropical and subtropical areas. In Hawaii it appears to be the most common parasite of *P. citri*. Zinna (1960) has made a very detailed study of the morphology, life history and etiology of this species.

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